REMARKS

Applicant has carefully reviewed the Office Action outstanding in the present application, and in response has amended the original claims to correct their numbering, has further amended claims 1, 2 and 9, and has added new claims 10-21 to provide the scope of protection to which applicant is deemed entitled. Favorable reconsideration of the application is respectfully solicited.

Claims 1 and 2 have been rejected under 35 USC 102 as anticipated by Furukawa, which is said to have the features recited in these claims.

The present invention is directed to a ring-type monolithic semiconductor laser having input and output facets, and operating to convert an optical signal having a first wavelength to a corresponding optical signal having a second wavelength. As described herein, the ring laser is activated, as by a first input signal at a first wavelength, to cause light to propagate in the ring in a first direction (for example, counter-clockwise). This propagating light produces an output signal, or beam, from the output facet at the first wavelength.

Application of a second input signal at a second wavelength to an input facet of the ring laser is directed to cause light to propagate in the ring in a second direction (for example, clockwise). If this second input signal has an intensity that is greater than the light propagating in the first direction, the light in this laser will change directions, and propagate in the second direction. This will switch off the original output beam.

On-off modulation of the second input signal will cause the output signal to switch between off and on states, respectively, this converting the modulated input signal at a second wavelength into a corresponding inverted modified output signal at

the first wavelength.

The converter described above is defined in claims 1 and 9 and in the claims dependent thereon. The method of the present invention is defined in independent claim 2 and in the claims dependent thereon as being a process for converting an optical signal of a first wavelength to a corresponding optical signal of a second wavelength. This process includes activating the laser to produce an output at a first wavelength, and supplying a second wavelength signal to selectively switch the first wavelength output on and off to thereby modulate the laser output.

The cited Japanese patent to Furukawa is a frequency converter which has neither the structure nor the function of the present invention, and thus cannot anticipate either of claims 1 and 2.

The cited patent discloses a laser configuration which includes an amplifier 1 coupled to a filter 2 (Fig. 1). When oscillation occurs, a signal f1 circulates in the laser. When an external optical signal at frequency f2 is supplied to the laser at input coupler 5, it mixes with the existing signal at frequency f1 to produce a third mixed signal at frequency f3. The circulating signals are supplied through output coupler 6 to a filter 8, which extracts the desired signal f3.

The Furukawa device has no facets, is not activated to produce a first wavelength output signal, and does not use a second wavelength input to modulate the output signal. To further emphasize these distinctions, claims 1 and 2 have both been amended to recite "monolithic" ring lasers, a structure not taught by the reference.

More particularly, claim 1 recites a monolithic ring laser having input and output facets. Furukawa has more of these features, as pointed out above. Claim 1 states that

the laser, when activated, produces an output beam of wavelength λ_2. The Furukawa device, when activated, does not produce an output signal; filter 8 prevents that. Claim 1 states that upon receipt of an input beam of wavelength λ_2 the output beam is switched off. The Furukawa device, in contrast, produces an output upon receipt of an input signal.

Claim 2 recites the steps of providing a monolithic ring laser having input and output facets. As noted above, Furukawa provides neither a monolithic device nor facets. Claim 2 recites the step of activating the laser to produce an output having a second wavelength, and this is contrary to the teachings of Furukawa, as noted above. Finally, claim 2 recites the step of modulating the output signal, which Furukawa does not teach.

Clearly, therefore, Furukawa does not anticipate claims 1 or 2 under 35 USC 102. Similarly, the claims dependent on claims 1 and 2, which recite additional features not found in the reference, are not anticipated.

Claims 3-9 have been rejected as unpatentable over the patent to Furukawa under 35 USC 103, on the ground that nonlinear process other than that disclosed in Furukawa could be used, and would be obvious.

Applicant respectfully disagrees, and submits that the nonlinear "modulation" taught by Furukawa neither suggests nor teaches the present invention, as claimed. Furukawa does not disclose a modulation of an output signal, but merely teaches the use of a filtered output to enable a selected frequency to be emitted, which frequency is produced upon missing of two other frequencies in a laser. This is not a modulation of an output; it is the generation of an output.

On the other hand, applicants produce an output at a first frequency/wavelength, and then use a second frequency/wavelength signal to turn the first one on and off. There is no suggestion of such a function in Furukawa, nor is a structure disclosed that would produce such an operation. In fact, Furukawa is constructed specifically to prevent what applicant is claiming. Furukawa provides a filter to prevent signal f1 from being emitted; in accordance with the present invention, as claimed, signal f1 is emitted.

Furukawa, therefore, teaches away from the present invention , and cannot suggest a modification of its own teachings that would lead to applicant's invention. The assertion in the Office Action that other nonlinear processes could be used is not supported in the reference itself, and cannot, therefore, be used as a basis for rejecting applicant's claims.

More particularly, claims 3-8 and new claim 21 all define method steps which are nowhere taught or suggested by the cited reference. This, for example, claim 3 states that the step of activating the laser includes injecting an optical signal. There is no suggestion of such a step in Furukawa.

Claim 4 is dependent on claim 3, and recites a modulating signal having an intensity greater than the intensity of the signal already propagating in the laser. There is no suggestion of this feature in Furukawa.

Claim 5 is dependent on claim 4, switching off and switching on to invert the modulating signal and convert it to a different frequency. There is no suggestion in the reference that the output signal f3 is an inverted signal f2 at a different wavelength.

Claim 6 is dependent on claim 4, and recites the step of providing first and

second ring lasers in cascade. No suggestion of this feature is found in Furukawa.

Claim 7 is dependent on claim 4, and defines the step of injecting a data pulse stream. No teaching or suggestion of this can be found in the reference.

Claim 8 is dependent on claim 2, and defines the step of injecting a signal of variable wavelength. No teaching or suggestion of this feature can be found in the reference.

New claim 20 is dependent on claim 2, and defines the steps of reversing the direction of light propagation in the laser, a feature clearly not suggested by Furukawa.

Independent claim 9 is directed to a wavelength converter, including a monolithic ring laser having input and output facets, thus distinguishing over the reference for the reasons discussed with respect to claim 1. Furukawa does not suggest such a structure, nor is there anything in Furukawa to suggest that such a structure would be obvious. The reference requires a ring laser having an amplifier 1 and an optical filter 2, and this teaching is not a suggestion that the claimed invention would be obvious.

Claim 9 further recites a first inlet modulating beam for propagation in a first direction, and a second inlet beam for propagation in a second direction. There is no teaching of the feature in Furukawa, nor is such a construction obvious from what Furukawa does teach, for the reference discloses a single inlet and propagation in a single direction. The reference cannot be construed to teach its opposite.

Claim 9 also states that the modulating beam has an intensity greater than that of the second beam so that its presence or absence modulates the output. No suggestion of such a feature is found in the reference.

Claims 16-19 are each dependent on claim 9, and add features which further

distinguish over the reference. Thus, claim 16 recites the reversal of direction of propagation, and claim 17 recites an input but stream as the modulator to produce an inverted output but stream. Claim 18 recites a tunable laser having a variable wavelength as the modulating input, and claim 19 defines a cascade structure. Claim 20 is dependent on claim 19, and defines cascaded lasers having different cavity lengths. None of these features are found in Furukawa, so each claim clearly distinguishes over the reference.

Claim 10 is dependent on claim 1, and defines first and second sources for supplying different wavelengths to the laser input. No such feature is suggested by Furukawa.

Claim 11 is dependent on claim 10, and adds the feature that the modulating signal has an intensity greater than that of the first (activating) signal to cause switching of the output. This further distinguishes over the reference.

Claim 12 is dependent on claim 11 and recites a photonic data stream which is inverted and frequency converted. No such features is disclosed or suggested in Furukawa.

Claim 13 is dependent on claim 10 and defines two input signals impinging symmetrically on an input facet. Nothing is found in Furukawa that would suggest this structure.

Claim 14 is dependent on claim 1 and defines the different directions of propagation of light in the laser that produces switching of the output signal, and this feature is nowhere to be found in Furukawa.

Claim 15 is dependent on claim 14, and defines the inverted output beam of the

invention, a feature not found in the reference.

From the foregoing, it is clear that the reference relied on in the Office Action has nothing to do with the present invention, and that the claims clearly define patentable subject matter. Accordingly, favorable reconsideration and allowance of the application is requested.

Respectfully Submitted,

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